

# Microtexture Variations and the Effects on Dynamical Behavior in Tantalum and Tantalum - Tungsten Alloy Plates

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Microtexture variations in annealed tantalum and tantalum-tungsten alloy plate materials have been studied by Orientation Imaging Microscopy (OIM) and correlated with the results of mechanical testing over a strain rate range of  $10^{-3} \text{ s}^{-1}$  to  $3000 \text{ s}^{-1}$ . A total of ten scans covering over  $38 \text{ mm}^2$  were performed on two separate specimens of pure Ta plate. These scans, as well as two or more each from the tungsten containing alloys examined specimen locations near the surface and spanning the centerline. Figure 1 shows a crystal direction map for pure Ta in which the grains shaded gray are oriented with  $\langle 111 \rangle$  directions within  $15^\circ$  of the plate normal and reveals significant texture banding. The microtexture variations in pure Ta are found to generally consist of a very high fraction of  $\langle 111 \rangle$  oriented grains near the centerline of the plate and a reduced fraction near the surface. The OIM results of the tantalum - tungsten alloy plates indicate less texture variations through-thickness, but reveal a complete change in texture from  $\langle 111 \rangle$  fiber to a  $\langle 100 \rangle$  cube texture with the addition of 2.5 wt.% W. Figure 2 plots the  $\langle 111 \rangle$  and  $\langle 100 \rangle$  direction fractions for specimen regions near the surface and spanning the centerline as a function of tungsten content. The change in the primary texture component is obvious while the large  $\langle 111 \rangle$  direction fraction difference between the surface and the center is ascribed as the cause of the anomalous "hourglassing" behavior during quasistatic compression testing. In addition, high strain rate experiments including Hopkinson Bar and the Punch-Through Shear Test indicate the importance of the microtexture variations on the dynamical behavior of pure Ta plate, and the homogenizing effects of the addition of tungsten.

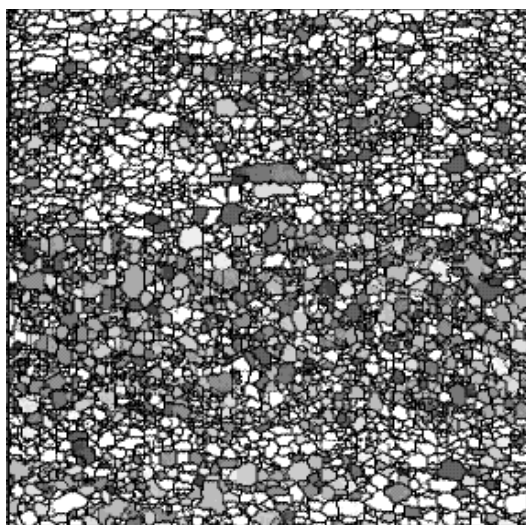


Fig. 1. Crystal direction map of pure Ta illustrating the microtexture variations from the surface (at top) toward the centerline.

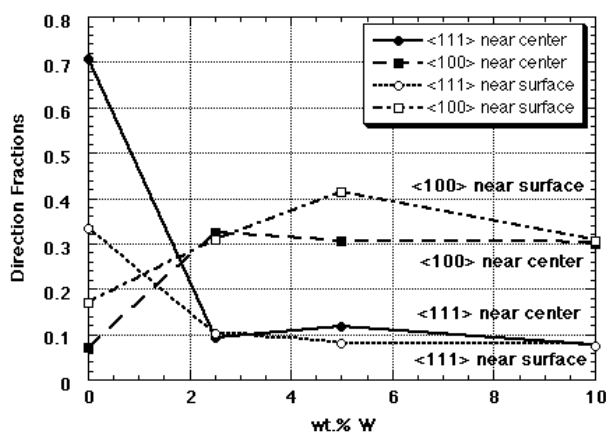


Fig. 2. Direction fractions as a function of W content revealing the change in texture from  $\langle 111 \rangle$  fiber to  $\langle 100 \rangle$  with W addition.

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